

RACHEL'S PROBLEMS

*From Videotape II:
"Children's Strategies for Addition/Subtraction"*

1. Lucy has 8 fish. She wants to buy 5 more fish. How many fish would Lucy have then?
2. TJ had 13 chocolate chip cookies. At lunch she ate 5 of them. How many cookies did TJ have left?
3. Janelle has 7 trolls in her collection. How many more does she have to buy to have 11 trolls?
4. Max had some money. He spent \$9.00 on a video game. Now he has \$7.00 left. How much money did Max have to start with?
5. Willy has 12 crayons. Lucy has 7 crayons. How many more crayons does Willy have than Lucy?
6. 11 children were playing in the sandbox. Some children went home. There were 3 children still playing in the sandbox. How many children went home?
7. Rodney is having some kids over for jelly donuts. 7 donuts can fit on one plate. How many plates will Rodney need for 28 donuts?
8. Karina had 20 cupcakes. She put them into 4 boxes so that there were the same number of cupcakes in each box. How many cupcakes did Karina put in each box?

CLASSIFICATION OF WORD PROBLEMS CHART

Problem Type			
Join	<i>(Result Unknown)</i> Connie had 5 marbles. Juan gave her 8 more marbles. How many marbles does Connie have altogether?	<i>(Change Unknown)</i> Connie has 5 marbles. How many marbles does she need to have 13 marbles altogether?	<i>(Start Unknown)</i> Connie had some marbles. Juan gave her 5 more marbles. Now she has 13 marbles. How many marbles did Connie have to start with?
Separate	<i>(Result Unknown)</i> Connie had 13 marbles. She gave 5 to Juan. How many marbles does Connie have left?	<i>(Change Unknown)</i> Connie had 13 marbles. She gave some to Juan. Now she has 5 marbles left. How many marbles did Connie give to Juan?	<i>(Start Unknown)</i> Connie had some marbles. She gave 5 to Juan. Now she has 8 marbles left. How many marbles did Connie have to start with?
Part-Part-Whole	<i>(Whole Unknown)</i> Connie has 5 red marbles and 8 blue marbles. How many marbles does she have?		<i>(Part Unknown)</i> Connie has 13 marbles. 5 are red and the rest are blue. How many blue marbles does Connie have?
Compare	<i>(Difference Unknown)</i> Connie has 13 marbles. Juan has 5 marbles. How many more marbles does Connie have than Juan?	<i>(Quantity Unknown)</i> Juan has 5 marbles. Connie has 8 more than Juan. How many marbles does Connie have?	<i>(Referent Unknown)</i> Connie has 13 marbles. She has 5 more marbles than Juan. How many marbles does Juan have?

CLASSIFICATION OF WORD PROBLEMS CHART (BLANK)

Problem Type			
Join	<i>(Result Unknown)</i>	<i>(Change Unknown)</i>	<i>(Start Unknown)</i>
Separate	<i>(Result Unknown)</i>	<i>(Change Unknown)</i>	<i>(Start Unknown)</i>
Part-Part-Whole	<i>(Whole Unknown)</i>		<i>(Part Unknown)</i>
Compare	<i>(Difference Unknown)</i>	<i>(Compare Quantity Unknown)</i>	<i>(Referent Unknown)</i>

FIGURE 3.3
Direct Modeling
Strategies

<i>Problem</i>	<i>Strategy Description</i>
<i>Join (Result Unknown)</i> Ellen had 3 tomatoes. She picked 5 more tomatoes. How many tomatoes does Ellen have now?	<i>Joining All</i> A set of 3 objects and a set of 5 objects are constructed. The sets are joined and the union of the two sets is counted.
<i>Join (Change Unknown)</i> Chuck had 3 peanuts. Clara gave him some more peanuts. Now Chuck has 8 peanuts. How many peanuts did Clara give him?	<i>Joining To</i> A set of 3 objects is constructed. Objects are added to this set until there is a total of 8 objects. The answer is found by counting the number of objects added.
<i>Separate (Result Unknown)</i> There were 8 seals playing. 3 seals swam away. How many seals were still playing?	<i>Separating From</i> A set of 8 objects is constructed. 3 objects are removed. The answer is the number of remaining objects.
<i>Separate (Change Unknown)</i> There were 8 people on the bus. Some people got off. Now there are 3 people on the bus. How many people got off the bus?	<i>Separating To</i> A set of 8 objects is counted out. Objects are removed from it until the number of objects remaining is equal to 3. The answer is the number of objects removed.
<i>Compare (Difference Unknown)</i> Megan has 3 stickers. Randy has 8 stickers. How many more stickers does Randy have than Megan?	<i>Matching</i> A set of 3 objects and a set of 8 objects are matched 1-to-1 until one set is used up. The answer is the number of unmatched objects remaining in the larger set.
<i>Join (Start Unknown)</i> Deborah had some books. She went to the library and got 3 more books. Now she has 8 books altogether. How many books did she have to start with?	<i>Trial and Error</i> A set of objects is constructed. A set of 3 objects is added to the set, and the resulting set is counted. If the final count is 8, then the number of objects in the initial set is the answer. If it is not 8, a different initial set is tried.

<i>Problem</i>	<i>Strategy Description</i>
<i>Join (Result Unknown)</i> Ellen had 3 tomatoes. She picked 5 more tomatoes. How many tomatoes does she have now?	<i>Counting On From First</i> The counting sequence begins with 3 and continues on 5 more counts. The answer is the last number in the counting sequence.
<i>Join (Result Unknown)</i> Ellen had 3 tomatoes. She picked 5 more tomatoes. How many tomatoes does she have now?	<i>Counting On From Larger</i> The counting sequence begins with 5 and continues on 3 more counts. The answer is the last number in the counting sequence.
<i>Join (Change Unknown)</i> Chuck had 3 peanuts. Clara gave him some more peanuts. Now Chuck has 8 peanuts. How many peanuts did Clara give to him?	<i>Counting On To</i> A forward counting sequence starts from 3 and continues until 8 is reached. The answer is the number of counting words in the sequence.
<i>Separate (Result Unknown)</i> There were 8 seals playing. 3 seals swam away. How many seals were still playing?	<i>Counting Down</i> A backward counting sequence is initiated from 8. The sequence continues for 3 more counts. The last number in the counting sequence is the answer.
<i>Separate (Change Unknown)</i> There were 8 people on the bus. Some people got off. Now there are 3 people on the bus. How many people got off the bus?	<i>Counting Down To</i> A backward counting sequence starts from 8 and continues until 3 is reached. The answer is the number of words in the counting sequence.

FIGURE 3.5
Counting Strategies for
Addition and Subtraction
Problems

on the counting sequence itself. Counting strategies generally involve some sort of simultaneous double counting, and the physical objects a child may use (fingers, counters, tally marks) are used to keep track of counts rather than to represent objects in the problem.

Although children frequently use fingers with Counting strategies, the use of fingers does not distinguish Counting strategies from Direct Modeling strategies. As illustrated in the following examples (and shown in the

HOW WOULD CHILDREN SOLVE THESE PROBLEMS?

In the space provided, describe a specific strategy for each problem and general strategy type.

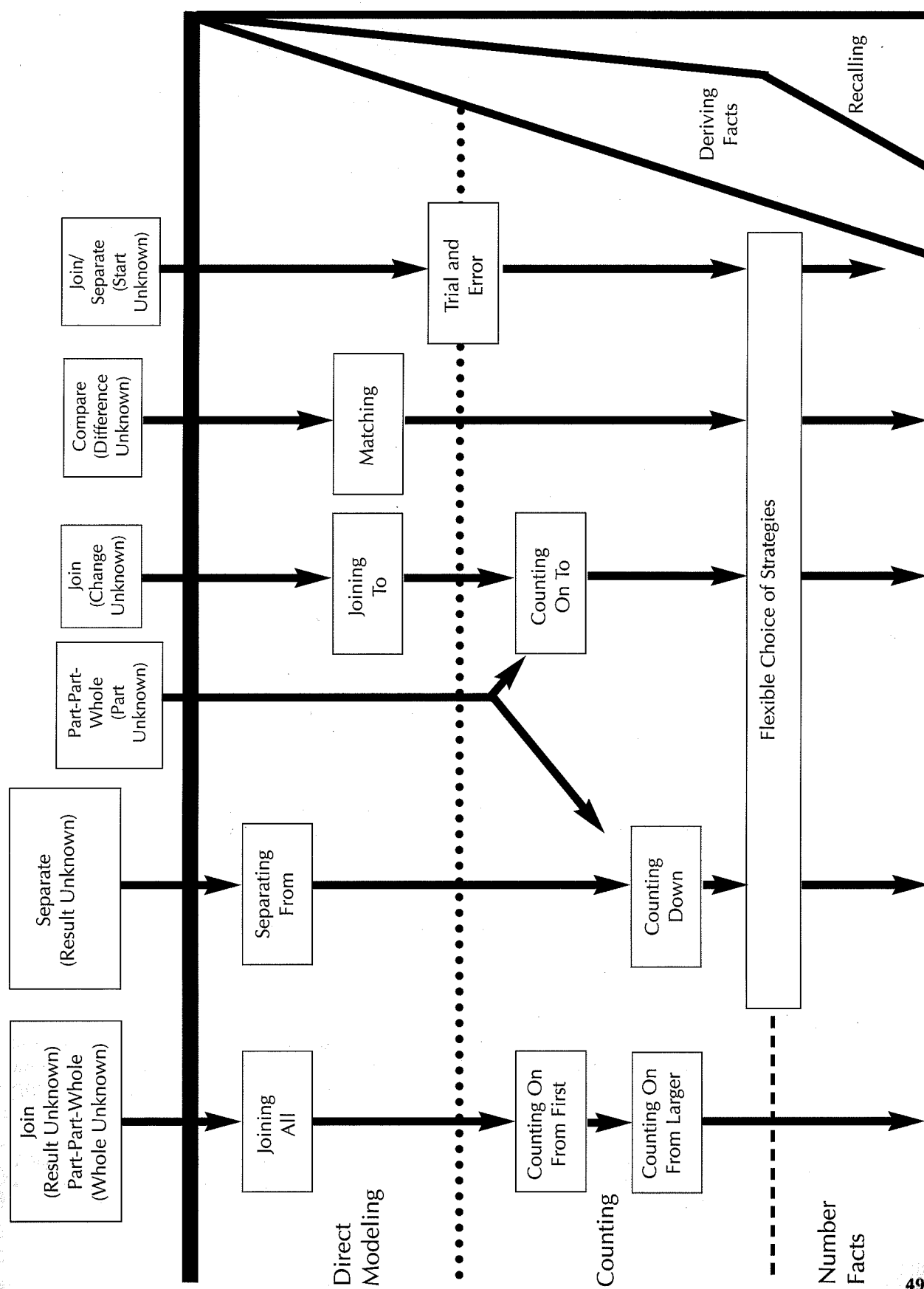
PROBLEM	PROBLEM TYPE	DIRECT MODELING STRATEGY	COUNTING STRATEGY	DERIVED FACTS STRATEGY	OTHER POSSIBLE STRATEGY
<p>[REDACTED] Laurie has 6 cats. Patrick will give Laurie some cats for her birthday. How many cats would Laurie need to get for her birthday to have 13 cats altogether?</p>					
<p>Jennifer bought a box of new markers for school. At Thanksgiving time, Norma gave her 9 more markers. At the winter break she counted her markers. There were 17 of them. Jennifer is sure she didn't lose any markers at all. How many markers were in the new box she bought?</p>					
<p>Karen and Luke love to walk and look at birds. Karen walked 4 miles this weekend. Luke walked 12 miles this weekend. How many more miles did Luke walk than Karen?</p>					
<p>Kevin loves blocks. He made a tower of 14 green and blue blocks. The cat came along and knocked over part, but not all, of the tower. There were 6 blocks left in the tower. How many blocks did the cat knock over?</p>					

FINDING A PROBLEM FOR A STRATEGY

Directions: Listed below are descriptions of strategies that children have used to solve problems. Assume that the children are using strategies that correspond to the structure of the problem posed to them. Decide which problem each child is solving; include the problem type and the numbers in the problem.

1. Kevin says, "9, 10, 11, 12, 13," and holds up a finger for each count after 9. He looks at his hand and says, "4, the answer is 4."
2. Janet draws seven lines as she counts, "1, 2, 3, 4, 5, 6, 7." She then leaves a space and draws six more lines as she counts, "8, 9, . . . 13." She looks at her drawing and counts the second set of lines. "1, 2, 3, 4, 5, 6, my answer is 6."
3. Eli counts out 16 cubes. She counts, "1, 2, 3 . . . 9" pulling one cube away from the group for each count. She then counts the remaining cubes, "1, 2, 3, . . . 7, my answer is 7."
4. Tory says, "12, 11, 10, 9, 8" and holds up a finger for each count after 12. He looks at his hand and says, "4, it is 4."
5. Anita says, "21, 22, 23, 24, 25" and holds up a finger for each count after 21. She says, "25, that is it, 25."

CHILDREN'S SOLUTION STRATEGIES CHART



ADDITION/SUBTRACTION
RELATIVE DIFFICULTY WORKSHEET

Directions: For each of the following pairs of problems, indicate which problem you think generally would be more difficult for first-grade students. Circle A if you think problem A is clearly more difficult than problem B. Circle B if you think problem B is clearly more difficult than problem A. Circle E if you think the problems are of approximately the same level of difficulty. Assume that the problems are read aloud to the children and reread as often as necessary so that reading ability is not a consideration. Also assume that the children have counters available, which they can use to help them solve the problem if they wish, and that they can take as long as necessary to solve the problem.

Problem A

Problem B

1. A B E

Mary had 11 gumballs. She ate 4 gumballs. How many gumballs does Mary have left?

Justin had 11 cookies. He gave 4 cookies to Lynn. How many cookies does Justin have left?

2. A B E

Myesha had 13 apples. She and her friends ate 5 of them. How many apples does Myesha have now?

Chris has 5 apples. How many more apples does Chris need to pick to have 13 apples all together?

3. A B E

Mark had 12 fish. He gave 8 fish to Penny. How many fish does Mark have left?

Doug has 12 snakes. Jan has 8 snakes. How many more snakes does Doug have than Jan?

4. A B E

Ann has 8 flowers. How many more flowers does Ann have to pick to have 12 flowers?

Mr. Smith has 12 dogs. 8 are big and the rest are little. How many little dogs does Mr. Smith have?

5. A B E

There are 14 hats in the closet. 6 are red and the rest are green. How many green hats are in the closet?

14 birds were in a tree. 6 flew away. How many birds were left?

6. A B E

Francis had 8 lollipops. His mother gave him 5 more lollipops. How many lollipops does he have now?

There are 8 girls and 5 boys on a soccer team. How many children are on the soccer team?

7. A B E

Michelle had 12 candy bars. She gave 5 of them to John. How many candy bars does Michelle have left?

Adrien had some apples. She ate 5 of them. Now she has 7 apples left. How many apples did she have to start with?

8. A B E

Nbip has 15 cookies. She eats 9 of them. How many cookies does she have left?

Kevin has 8 stickers. If he gets 9 more stickers how many stickers will he have then?

ADDITION/SUBTRACTION RELATIVE DIFFICULTY WORKSHEET (RESPONSES)

The following list gives the identification of each problem type on the worksheet and the relative difficulty for each pair.

Pair	Problem Type		More Difficult
	A	B	
1.	Separate (Result Unknown)	Separate (Result Unknown)	E
2.	Separate (Result Unknown)	Join (Change Unknown)	B
3.	Separate (Result Unknown)	Compare	B
4.	Join (Change Unknown)	Part-Part-Whole (Part Unknown)	B
5.	Part-Part-Whole (Part Unknown)	Separate (Result Unknown)	A
6.	Join (Result Unknown)	Part-Part-Whole (Whole Unknown)	E
7.	Separate (Result Unknown)	Separate (Start Unknown)	B
8.	Separate (Result Unknown)	Join (Result Unknown)	E